Introduction to Problem based Learning – The AAU Way

A Course given by:

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Both Associated Professors at Aalborg University

Tuesday, the 29th of August 2006: Supervision + courses

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Introduction to role play</td>
</tr>
<tr>
<td>9:15</td>
<td>Exercise: Role play of a supervising situation</td>
</tr>
<tr>
<td>10:00</td>
<td>Coffee</td>
</tr>
<tr>
<td>10:20</td>
<td>Exercise continued</td>
</tr>
<tr>
<td>12:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>13:00</td>
<td>Supervision</td>
</tr>
<tr>
<td>14:15</td>
<td>Coffee</td>
</tr>
<tr>
<td>14:45</td>
<td>Courses</td>
</tr>
<tr>
<td>15:15</td>
<td>Unanswered questions</td>
</tr>
<tr>
<td>15:45</td>
<td>Until next time?</td>
</tr>
<tr>
<td>16:00</td>
<td>End of day two</td>
</tr>
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</table>

Role-play

- Six role plays illustrate supervising situations (meetings)
- Imagine that your group is working on the project from yesterday
- The group members assign roles between themselves, so that the outlined situation in the role play occurs
- Each role play lasts approximately 15 minutes
- Each role play is commented by 4-5 observers
Lunch until 13.00

**Content of Supervision - 1**

Problem oriented Supervision helps the group to:

- Distinguish between subject, problem and perspective
- Sustain the methodical perspective
- Work reflexive

**Content of Supervision - 2**

Discipline/Subject oriented Supervision helps the group to:

- Connect/combine their problem with scientific knowledge
- Find relations between empirical data and theory
- Find central litterateur
### Ideal content of Supervision

<table>
<thead>
<tr>
<th>Problem oriented</th>
<th>+</th>
<th>Discipline/Subject oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinguish between subject, problem and perspective</td>
<td>+</td>
<td>The group connect/combine their problem with scientific knowledge, theory and techniques</td>
</tr>
<tr>
<td>Sustain the methodical perspective from formulation of the problem through analysis until solution</td>
<td>+</td>
<td>To formulate theoretic and empirical perspectives and problems</td>
</tr>
<tr>
<td>Work reflexive by continued assessment of the groups work focusing on necessary adjustments and delimitations</td>
<td>+</td>
<td>To find relations between empirical data and theory</td>
</tr>
</tbody>
</table>

### Forms of Supervision

- Process supervision
- Product supervision
- Control Supervision
- Laissez-faire Supervision

### Forms of Supervision - 1

**Process supervision:**

- Sees the project as a cognitive process
- Facilitates co-operation in the group
- Starts reflexive processes
- Asks facilitating (reflexive) questions in stead of pointing out solutions
Forms of Supervision - 2

Product supervision:

- Focus on theoretical knowledge
- Focus on solutions, which are often given
- Project report must be coherent
- The product/construction (or part of) should be finished

Forms of Supervision - 3

Control Supervision:

- The group is tested
- Thinks on the exam
- The project period is one long exam
- Is interested in the knowledge of the individual student

Forms of Supervision - 4

Laissez-faire Supervision:

- The students are left to themselves
- Lack of engagement
- General and occasional comments
- Uses minimal time
**Situated supervision**

- Where in the process
- Where in the education
- Type of projects and objectives
- Type of students
  - Experienced?
  - Brilliant or poor students
  - Social competence

*Ability to read the situation* ....

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**Communication maps during a project**

- Beginning of the project
- Progressing in the project

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(http://meds.queensu.ca/medicine/pbl/pblhome.htm)
Characteristics for a well functioning group:

- Common goal or objectives
- Agreement about group norms, rules
- The members "play" all the necessary roles
- All group members respect each other
Co-operation: group classification

<table>
<thead>
<tr>
<th>Role casting</th>
<th>Integrated</th>
<th>Instrumental</th>
<th>Hierarchic</th>
<th>Chaotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Some</td>
<td>Some</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Work sharing</td>
<td>All</td>
<td>Some</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>ControlLeadership</td>
<td>All</td>
<td>Yes</td>
<td>Few</td>
<td>No</td>
</tr>
<tr>
<td>Power</td>
<td>Equal</td>
<td>Equal ?</td>
<td>Unequal</td>
<td>No</td>
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<tr>
<td>Personal Engagement</td>
<td>High</td>
<td>Fair</td>
<td>Different</td>
<td>Low</td>
</tr>
<tr>
<td>Group identity</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Conflict solving</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Ideal Learning environment from the perspective of students - group work

- Ideal group size: 3-4 people
- Most important things that make group work function
  - Positive attitude
  - Constructive communication
  - Cooperation
  - Compromise
  - New perspectives

Learning environment from the perspective of students - lectures

- How do lectures function for learning?
  - Application to practice
  - Relation to the project.

Lecturers give you kind of indications – what are we talking about here? What is the motivation? What is the subject? But normally you don’t really understand it during the lectures. Then you come back to the group room and sit down, facing the problem. You are motivated when you get into the thinking process when trying to solve the problem in the course exercises, especially when they are related to the project. You can look at the computer and get some experiences by doing it. Then the lecturers will visit the group room, and you can talk with them, who can explain to you things in a situation and context. In this way you can gain more understanding.
Learning environment from the perspective of students - lectures

Expectation to lecturers
- Technical knowledge
- The art of teaching (more important) to make the ‘killer courses’ interesting rather than to kill the interesting courses
- Engagement - pay attention to students
- Providing interesting, understandable informative presentation with clear overviews and well-organized structures (providing slides by emails)
- Providing clear learning goals
- Providing examples to link abstract theories and real life
- Personality - humorous, motivating, provocative

Learning environment from the perspective of students - supervision

Functions of supervisors
- Beginners of each project / the study program
  More direct inputs regarding how to the project work started and relevant technical knowledge
- Later part of the project / education
  Structural comments, emergency support

‘In the first year, we had no idea what we can expect from them and how to communicate with them. So lots of problems coming out along the way. Now we know what we can do from our part. If we have specific problem we have to solve, we will tell him and be clear about what specific help we expect to get. We prepare something for him to read for comments.’ - student group

Learning environment from the perspective of students - supervision

Expectation to supervisors
- clear information about what can be expected
- Technical knowledge
- The art of teaching (more important)
  - Engagement, willingness to help
  - Accessibility
  - Mental support, especially in case of problems
  - Instruction of methods (how to learn) regarding how to solve the project and do the project rather than facts answers
  - Constructive communication - with clear knowledge about the expectation from both sides
What might go wrong in the co-operation between supervisor and group?

Different expectations

Students' opinions on supervision

Good Supervision:

- Overview in chaos
- Cut through in critical situations
- Solutions are not presented by the supervisor
- Ask facilitating questions
- The project is not controlled by the supervisor but by the group itself
- Supervisor is well prepared and well informed
Students’ opinions on supervision

Poor Supervision:

- Supervisor does not express opinions about affective questions
- Supervisor does not give constructive feedback/criticism
- Lack of interest in the project and/or the students
- The supervisor has poor knowledge about the students’ work and work process
- Supervisor takes ownership of the project and controls the students’ learning process

Roles of the supervisor – good or poor?

- **The group member** – discipline oriented supervision with focus on product
  - Takes over responsibility for the project work
  - Very active in choice of theory and methods
  - Gives answers in stead of asking questions
- **The visitor** – both discipline and problem oriented supervision with focus on process
  - Stands on the sideline, ready to kick or withdraw
  - Points out directions where to seek answers
  - The students own the project
- **The consultant** – discipline or problem oriented laissez-fair supervision
  - Only activated on request
  - Only answers the questions asked
  - Leave all decisions, planning and control to the group

Tasks of a supervisor

- Before the semester start:
  - Prepare project proposals
  - Plan project courses
- In the beginning of a project:
  - Help to find appropriate literature
  - Help to establish contacts with companies etc.
  - Discuss the potential of the project proposal with students
- During the whole project period:
  - Give comments to both oral and written presentations/memos/working papers
  - Monitor the progress and professional level of group and individual students
- At the end:
  - Prepare for the examination
  - Chair the examination
Tools for supervision

- Learning objectives (Bloom’s taxonomy)

Bloom’s taxonomy for the cognitive domain

A hierarchy with 6 levels:

1. Knowledge (memorize)
2. Comprehension (translate, interpret)
3. Application (use in new situations)
4. Analysis (uncover relations between entities)
5. Synthesis (building something new of the entities)
6. Evaluation (judging)

More info: http://faculty.washington.edu/krumme/guides/bloom.html

Tools for supervision

- Learning objectives (Bloom)
- Contracts
Contracts

What?
- Contract with supervisor
- Group contracts

Why?
- Create common expectations
- Secure clear agreements

Contracts

How?
Content could be:
- Meetings (where, when, how often, how long, agenda, chair etc.)
- Communication (how, how often, how quick, topics etc.)
- Feedback (response to working papers, response to process)
- Objectives (students’, supervisor’s, study regulation objectives)
- External contacts
- Any other items

Contracts

How?
- Ask the group to formulate their expectations and obligations to you in writing
- Formulate your own expectations and obligations to the group in writing
- Match the two draft contracts in a meeting and agree upon a mutually binding contract
**Contract – an example**

- **DRAFT Contract between project group XX and supervisor NN**

- What I am willing to do (if you want me to)
  - Help... Meet... Discuss... Read...

- What I prefer not to do
  - Meet... Read....

- What I expect of you
  - write a memo, send the memo, chair meetings etc.

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**Group contract – an example**

Collaboration agreement for the members of group 5/67:

- In order to receive the best collaboration, following must be expected:
- We are all under obligation to attend meetings. If it is impossible to make it, notify another member of the group. Notes must be taken or handed off at all meetings.
- A laptop will be used to take notes in meetings with the supervisor. Everyone must get a copy.
- Group meetings must be at least once a week. Preferably after 9 am.
- Returned assignments must be handed out the day before meetings, latest at 10 am. This must be read before the meeting. If material did not get out in time, there will be time to read it to the other group members at the meeting.
- In order to keep the session work-up, there must be breaks to return and "have fun."
- If a member of the group has difficulty getting started, we are all under obligation to help the member getting started.
- If anyone has a problem with the group, the project or any other conflict, it must be discussed and a solution must be found ASAP. If the above is not respected, the members of the group will have to decide how to conclude the group.

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**Tools for supervision**

- Learning objectives (Bloom)
- Contracts
- Students’ peer assessment
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**Students’ peer assessment**
- Students in the same group reviewing each other’s written material
- Students in the same group giving mini-lectures for each other
- Two groups acting as opponents for each other at seminars and exams

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**Tools for supervision**
- Learning objectives (Bloom)
- Contracts
- Students’ peer assessment
- Process analysis

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**Process analysis - content**

<table>
<thead>
<tr>
<th>1</th>
<th>Expectations for This Semester</th>
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<tbody>
<tr>
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<td>Project Planning</td>
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<tr>
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<td>Project management</td>
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<td>2.2</td>
<td>Obtaining overview of the process</td>
<td>6</td>
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<tr>
<td>2.3</td>
<td>Conclusion</td>
<td>7</td>
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<tr>
<td>3</td>
<td>Collaboration Within The Group</td>
<td>10</td>
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<tr>
<td>3.1</td>
<td>Assignments</td>
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<tr>
<td>3.2</td>
<td>Collaboration agreement</td>
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<tr>
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<td>Meetings</td>
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<td>3.6</td>
<td>Conclusion</td>
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<td>4</td>
<td>Collaboration With The Supervisor</td>
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<td>4.5</td>
<td>Conclusion</td>
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<td>5</td>
<td>Communication With Our Client</td>
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<td>6</td>
<td>Conclusions</td>
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<tr>
<td>6.2</td>
<td>Collaboration in the group</td>
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</tr>
<tr>
<td>6.3</td>
<td>Collaboration with the supervisor</td>
<td>19</td>
</tr>
</tbody>
</table>
Process analysis – example

Project Planning

We all agreed that there were some main points to be considered, before we could start with our project.

Goals: What do we want to achieve with this project?

Assignments: Who does what?

Deadlines: What should be finished and when?

Our goal was to use the knowledge that we had gained during the first semester, and to fulfill the intermediate goals. See appendix C. Furthermore we wanted to make a user-friendly website, and satisfy our clients. We had to have some deadlines to keep some structure into our project. See section Obtaining overview of the process. All the different assignments should be distributed between the group members, so everyone had something to do. See section Assignments.

2.1 Project management

Tools for supervision

• Learning objectives (Bloom)
• Contracts
• Students’ peer assessment
• Process analysis
• Facilitation

Facilitation

• Summarize
• Mirror students’ work
• Ask open-ended questions using 6-W
• Encourage students to keep a dynamic list of questions
• Give feedback by rethinking aloud
Tools for supervision

- Learning objectives (Bloom)
- Contracts
- Students' peer assessment
- Process analysis
- Facilitation
- Questioning the team work

Questioning team work - 1

Put on the students’ agenda when starting the project:
- level of ambitions
- how to share the work
- meeting discipline
- how to solve conflicts
- social relations

Questioning team work - 2

During the project:
- ask to the way the students organize the work and discuss the working process
- ask to special project functions
- discuss objectives for the organizational aspects
- give individual consultations
- feel the atmosphere - be present
- let the students discuss
- try to involve all the students
**Project supervision - preparation**

The group (two days in advance):
- What have we accomplished (working papers)
- What are we doing right now
- Requested supervision
- Agenda

The supervisor:
- Read the working papers
- Reflect upon and formulate questions to structure, form and content
- Prepare for input to requested supervision

**Project supervision – meeting**

The group:
- Chairs the meeting
- Takes minutes
- Presents the points of the agenda
- All students participate in discussions

The supervisor:
- Facilitates the students’ own reflection by asking questions
- Involves all students in discussions
- Secures reflections on:
  - Contracts, working processes, progress, time schedule etc.

**Project supervision – follow up**

The group:
- Sends minutes of the meeting to the supervisor
- Discusses and assesses the input from the supervisor
- Revises working papers, time schedule etc.

The supervisor:
- Reads the minutes and replies
- Follows up on requested tasks
Course Description
Optimal Control Theory

Purpose:
To give the students knowledge in optimal control and practical experience with optimal control strategies based on minimisation of a performance index.

Contents:
- Dynamic programming
- LQ control
- Introduction of reference and disturbance conditions
- Introduction of integral conditions
- Use of observer, LQG control
- The position of closed loop poles

Prerequisites: Analogue and Digital Control (FP6-4, PR6-1, PR6-2), Stochastic systems (FP6-3, FP9-5)

Duration: 1 module
Category: Project theme course (PE-course)
Courses

Each lesson/lecture (Mini module):

- Duration 3 hours 45 minutes (½ day)
- 2 lectures app. 45 min each
- Exercises in groups, app. 2 hours
  - The lecturer is now instructor

The purpose of the combination of lectures/exercises is to increase the comprehension of the curriculum
Courses

What kind of exercises should you chose to promote comprehension and methodical ness?

• Good examples of the central topics in the lecture, that forces the students to use the basic principles behind the theory

How should you act as instructor during the exercises in the groups?

• Ask questions about how they have made their solution
• Make sure that they have understood the basic principles of the problems

Courses

Differences between project course (PE) and study course (SE)

• Examination
  – PE has no formal examination by the lecturer, it is examined during the project examination by the supervisor
  – SE is examined by the lecturer, normally as a written examination (passed/non passed)

• Exercises
  – PE is used in the project, exercises is examples
  – In SE the student must learn to solve examination exercises